Started on	Tuesday, 2 January 2024, 3:00 PM
State	Finished
Completed on	Tuesday, 2 January 2024, 3:29 PM
Time taken	29 mins 38 secs
Grade	**8** out of 10 (**80**%)

Question **1**

Incorrect

Mark 0 out of 1

The value of α for which the solution of the initial value problem $y'' + y' - 2y = 0$, $y(0) = \alpha$, $y'(0) = 1$ approaches 0 as $t \to \infty$

Select one:

- $-\frac{3}{2}$ ✖
- 1
- $-\frac{1}{2}$
- -1

The correct answer is: $-\frac{1}{2}$

Question **2**

Correct

Mark 1 out of 1

The function $y(t) = e^{-2t}\cos(2t) + e^{-2t}\sin(2t)$ is a solution of the differential equation

Select one:

- $y'' + 4y' - 5y = 0$
- $y'' - 4y' + 5y = 0$
- $y'' + 4y' + 8y = 0$ ✔
- $y'' + 4y' + 5y = 0$

The correct answer is: $y'' + 4y' + 8y = 0$

Question **3**

Correct

Mark 1 out of 1

The general solution of the differential equation $y'' - 2y' + 3y = 0$ is

Select one:

- $y(t) = c_1 e^t \cos(\sqrt{2}t) + c_2 e^t \sin(\sqrt{2}t)$ ✔
- $y(t) = c_1 e^{-t} \cos(\sqrt{2}t) + c_2 e^{-t} \sin(\sqrt{2}t)$
- $y(t) = c_1 e^{-t} \cos(2t) + c_2 e^{-t} \sin(2t)$
- $y(t) = c_1 e^t \cos(2t) + c_2 e^t \sin(2t)$

The correct answer is: $y(t) = c_1 e^t \cos(\sqrt{2}t) + c_2 e^t \sin(\sqrt{2}t)$

Question **4**

Correct

Mark 1 out of 1

The longest interval in which a unique solution of the initial value problem $t(\ln t - 1)y'' + ty' + y = \csc t, y(1) = 1, y'(1) = 1$ is certain to exist is

Select one:

- $(0, e)$ ✔
- $(1, \pi)$
- $(1, e)$
- (e, π)

The correct answer is: $(0, e)$

Question **5**

Correct

Mark 1 out of 1

The general solution of the differential equation $y'' - 6y' + 9y = 0$ is

Select one:

- $y(t) = c_1 e^{-3t} + c_2 te^{-3t}$
- $y(t) = c_1 e^{3t} + c_2 te^{3t}$ ✔
- $y(t) = c_1 e^{3t} + c_2 e^{-3t}$
- $y(t) = c_1 e^{4t} + c_2 te^{4t}$

The correct answer is: $y(t) = c_1 e^{3t} + c_2 te^{3t}$

Question **6**

Correct

Mark 1 out of 1

The solution of the initial value problem $y'' + 4y = 0, y(0) = 1, y'(0) = -2$ is

Select one:

- $y(t) = \cos(4t) + \sin(4t)$
- $y(t) = \cos(2t) - \sin(2t)$ ✔
- $y(t) = \cos(2t) + \sin(2t)$
- $y(t) = 2\cos(2t) + \frac{1}{2}\sin(2t)$

The correct answer is: $y(t) = \cos(2t) - \sin(2t)$

Question **7**

Incorrect

Mark 0 out of 1

Given that $W(y_1, y_2)(t) = t^4 e^t$, $y_1(t) = t^2$, then a possible function of $y_2(t)$ is

Select one:

- $t^2 e^t + t$
- $t^4 e^t + t^2$ ✖
- $te^t + t^2$
- $t^2 e^t + 2t^2$

The correct answer is: $t^2 e^t + 2t^2$

Question **8**

Correct

Mark 1 out of 1

Given that $y_1(x) = x$ is a solution of the differential equation $(1 - x^2)y'' + 2xy' - 2y = 0$, $x \in (-1, 1)$. Using the method of reduction of order, a second solution has the form $y_2(x) = v(x)y_1(x)$ where $v(x) =$

Select one:

- $x + \frac{1}{x}$ ✔
- $x^2 - x$
- $x + 1$
- $1 + x^2$

The correct answer is: $x + \frac{1}{x}$

Question **9**

Correct

Mark 1 out of 1

The general solution of the differential equation $2y'' + 3y' + y = 0$ is

Select one:

- $y(t) = c_1 e^{t} + c_2 e^{-t/2}$
- $y(t) = c_1 e^{2t} + c_2 e^{t}$
- $y(t) = c_1 e^{-t} + c_2 e^{-t/2}$ ✔
- $y(t) = c_1 e^{-t} + c_2 e^{t/2}$

The correct answer is: $y(t) = c_1 e^{-t} + c_2 e^{-t/2}$

Question **10**

Correct

Mark 1 out of 1

The Wronskian of any solutions y_1 and y_2 of the differential equation $((x+1)y')' + y' + 2y = 0$, $x > -1$ is

Select one:

- $C(x+1)^{-1}$
- $C(x+1)^{-2}$ ✔
- $C(x+1)$
- $C\ln(x+1)$

The correct answer is: $C(x+1)^{-2}$